

SQUEEZE-BOTTLE OF LIQUID MEDICINE

The present invention relates to a bottle for liquid medicine.

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Typically, bottles for liquid medicine have an open neck, and the medicine is dispensed by pouring. The bottle is not adapted to be squeezed to impel the medicine from the bottle. Rather, it flows under gravity, into a measuring
10 spoon or the like. When the measuring spoon is full to the required mark the bottle is placed upright again, and the cap put on sealingly to cover the neck.

This traditional approach has advantages of simplicity and
15 economy, and it has been in use for many years. However it does have disadvantages. Dispensing liquid medicine by pouring is not always easily controlled and can induce spillages, especially when the medicine is of low viscosity. Secondly, when the bottle is placed upright
20 after pouring, the medicine on the rim of the bottle space neck does not always flow back inside the neck. It may run down the outside of the neck and even run onto and down the body of the bottle, below the neck. The result is the formation of sticky residues on the outside the
25 bottle. It may become very messy to handle and may make the place in which the consumer stores medicines sticky (eg the base of a medicine cabinet). The user may perceive that the sticky medicine residues are deleterious to hygiene, especially when near the neck of the bottle.

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It is an object of the present invention to provide a medicine bottle which overcomes or eases at least one of the problems mentioned above.

In accordance with a first aspect of the present invention there is provided a bottle containing liquid medicine, the bottle having a neck containing a self-sealing closure, 5 the bottle being flexible such that, when it is inverted or tilted downwardly, squeezing the bottle produces a flow of liquid medicine through the closure, and releasing the bottle terminates the flow of liquid medicine.

10 By "inverted or tilted downwardly" we mean that the bottle is oriented with the neck as the lowest part of the bottle.

Preferably the bottle has visually distinct upper and 15 lower regions and a waist at the junction between them.

Preferably the upper region has rounded, downwardly sloping shoulders extending between the waist and the neck of the bottle.

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Preferably each shoulder is substantially an arc of a circle. Preferably the arc is 40-80°, preferably 50-70°, of a circle whose centre is adjacent to the waist at the bottom of the opposite shoulder, but within the extent of 25 the bottle.

Preferably the lower region of the bottle tapers from the base of the bottle to the waist.

30 Preferably the lower region is taller than the upper region.

More preferably the waist is located between 25% and 45%, most preferably between 35 and 42%, of the distance from the bottom of the neck of the bottle to the base of the bottle.

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Preferably the height of the lower region is between 4 and 10 cm, preferably between 5 and 7 cm.

10 Preferably the height of the upper region is between 3 and 5 cm.

Preferably the height of the bottle, up to the base of the neck, is between 7 and 15 cm, preferably between 8 and 12 cm.

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Preferably the external walls of the bottle represent the boundaries for the liquid medicine; preferably there is no bottle liner.

20 Preferably the volume of the bottle, up to the base of the neck, is between 50 and 250 ml, more preferably between 80 and 200 ml, most preferably between 100 and 160 ml.

Preferably the bottle has front and rear panels.
25 Preferably each is movable toward the other. These may be connected directly to each other - preferably such that the bottle is generally oval in cross-section - or may be connected together by means of side walls. Most preferably the bottle is generally of box form, having
30 larger front and rear panels connected to each other by two narrower side walls.

The front and rear panels are preferably each somewhat outwardly bowed so that they may be moved into a flatter form, one toward the other, to impel medicine from the bottle.

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Preferably the bottle is designed such that the front and rear panels may be moved smoothly from their rest position to their fully inward position. By this we mean that the wall material of the bottle does not kink or crease abruptly as the panels are moved to their fully inward position.

Preferably the bottle is designed such that there is a limit to the inward movement of the front and rear panels in normal use, the limit position preferably being, under a moderate squeezing force adequate to provide the flow of liquid, the limit of flexure rather than the onset of kinking, creasing, or the like. Preferably the volume of the bottle in this limit position of the front and rear panels is at least 80% of the volume of the bottle.

It is preferably the front and rear panels which, in elevation, show the outline of any shaping of the bottle - for example when the upper region has shoulders and/or the lower region tapers. However, it is correspondingly the side walls which preferably have these features in relief.

Preferably the maximum width of the front and rear panels is at least twice the maximum width of the side walls (when provided).

When the bottle has side walls it is designed such that the bottle cannot be pressed by force applied across the

side walls to any useful degree, i.e. without the wall material kinking or creasing.

Preferably the bottle is made of a plastics material of such a type, and formed with such a thickness, that it may be elastically flexed in order to reduce the volume of the container, and impel liquid medicine inside it. A suitable material is a polyester, for example polyethylene terephthalate (PET). Preferably the bottle material is transparent, but is UV-resistant and/or coloured, preferably being brown. The bottle may be formed by a regular bottle-forming process in which a body of plastics material is heated and blown into a mould cavity.

The neck of the bottle preferably has press-fitted into it, in a sealing manner, a valve module, containing the self-sealing closure. The self-sealing closure preferably has a fitment piece, for securement in the neck, and a valve. The fitment piece preferably includes an annulus of supporting material, preferably a rigid plastics material, which has, depending orthogonally from it, a cylindrical piece which fits grippingly within the neck of the bottle, and, extending laterally outside that, a flange which rests against the rim of the neck. Within the annulus is the valve. The valve is preferably a slit valve of a plastics material, for example of an elastomeric or polyolefin material. Preferably, the plastics material is an elastomeric material, most preferably a silicone elastomeric material. Preferably the valve is urged open by raised pressure inside the bottle, and automatically seals over once again, when the pressure is released. Examples of such valves may be seen in US 5954237, US 5439143 and US 6446844. A preferred

valve has contacting surfaces which are spread apart to allow the liquid to pass. Preferably the valve does not comprise a flap, for example a hinged or cantilevered flap.

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The external surface of the neck may be formed with a screw thread, onto which a cap may be screwed. The cap is preferably of a child-proof type. Preferably the cap is of a tamper-evident type.

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Preferably, the medicine is a viscous liquid, most preferably a syrup.

Thus a preferred embodiment of the invention is a bottle containing liquid medicine, the bottle having a self-sealing closure in its neck; the bottle being flexible such that when it is inverted, squeezing the bottle produces a flow of liquid medicine through the closure, and releasing the bottle terminates the flow of liquid medicine, preferably with the bottle reverting to its original shape; the bottle preferably being shaped so as to assist this operation, in particular in preferably having major front and rear panels, which can be controllably flexed.

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In a second aspect there is provided a method of dispensing liquid medicine, using a liquid medicine-containing bottle of the first aspect.

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In use, a bottle containing liquid medicine has its cap removed and is turned so that the neck is lowermost. A measuring spoon or cup is held beneath the neck and the bottle gently squeezed, whereupon a smooth stream of

liquid medicine is impelled into the spoon or cup. When the spoon or cup contains the required amount of medicine the user releases the squeezing force and the stream of medicine is immediately terminated, without dripping. The
5 bottle is placed upright once again and the cap replaced.

It is observed that there is a negligible amount of medicine, or no medicine at all, left outside the bottle, and that dispensing is very precise.

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The bottle has been designed to promote easy and accurate operation. The preferred features of the taper in the lower region and the shoulders of the upper region, with the waist between them, are such that users are encouraged
15 to hold the front and rear panels of the bottle. Notably they may grasp the lower region of the bottle, either with their finger wrapped around the lower region, with their forefinger around the waist, or with fingertips against one of the panels and thumb against the other of the
20 panels. In either position the natural action is to gently press the front panel and/or the rear panel.

The invention will now be further described, by way of example, with reference to the accompanying drawings in
25 which:

Fig. 1 is a frontal view of a bottle of the invention with its cap off;

30 Fig. 2 is a side view of the same bottle with its cap on;

Fig. 3 is a plan view of the same bottle with its cap off, from above; and

Fig. 4 is an under-plan view of the same bottle, from below.

- 5 The bottle shown in the drawings contains a viscous liquid medicine, such as a cough syrup.

As may be seen most clearly from Figs. 1 and 2 viewed together, the bottle may generally be described as being
10 of box-form, having front and rear panels 2, 4, identical with each other, and two side panels indicated generally as 6, 8, identical with each other. The width of the side panels is considerably less than the width of the front and rear panels, by a ratio of approximately 1:3.

15 However, although the bottle may be viewed as having a box-like structure, as distinct from a traditional bottle shape of a cylinder surmounted by a frusto-conical top region, it is not of cuboid shape. Superimposed upon the
20 generally box-like structure are important shape features, which will now be described.

The bottle has a lower region 10, and an upper region 12. The bottle's neck 14 projects upwards from the top of the
25 upper region.

As can be seen in the frontal view of Fig. 1, the lower region tapers in the upward direction. In other words, the side panels 6, 8 are somewhat inwardly directed, in
30 the lower region.

Also as shown best in Fig. 1, the upper region has two outwardly projecting formations, in the form of shoulders

15, 16. The shoulders are rounded and downwardly sloping, and extend between the neck of the bottle and the junction between the upper region and the lower region. It may be seen that at this junction the bottle has a waist 18.
5 Each shoulder can be seen as representing an approximately 60° arc of a circle whose centre is near to the opposite shoulder, adjacent to the waist 18.

It will be apparent that the shoulders 15, 16 are formed
10 as relief features in the side panels 6, 8, and this can best be seen in Fig. 2.

It will be seen in Fig. 2 that in the side walls the junction between each shoulder 15, 16 and the respective
15 tapering region 6, 8 is of curved, upwardly-facing form.

The front and rear panels 2, 4 and the side panels 6, 8 terminate at the bottom of the bottle in a base wall 20, shown in Fig. 4. From this it may be seen that the front
20 and rear panels 2, 4 are markedly convex. The side walls 6, 8 are very slightly convex. Due to their convex shape portions of the side walls may be seen in Fig. 2, and are indicated as 2A, 4A.

25 Fitted into the neck 14 of the bottle is a self-sealing closure 24, seen in Fig. 4. The closure consists of an annular plastics body 26 resting on the rim of the neck. It has as cylindrical part (not shown) resiliently retained within the neck. The plastics body supports in
30 the opening within it a cross-slit silicone valve 28. The valve 28 is of the type which remains closed in all orientations until the liquid medicine is in some manner

impelled. When the impelling force is removed the closure seals once again.

The bottle wall is of a brown transparent flexible plastics (PET) material. Its volume may be reduced by squeezing, in order to impel liquid medicine through the closure 24. Because of the design of the bottle the side panels 6, 8 feel comparatively rigid whereas the front and rear panels 2, 4 feel much more flexible, in the upper region 12 and, especially, in the lower region 10. The bottle is designed such that the front and rear panels may be moved smoothly towards each other but with immediate relaxation when the force is removed. Applying a similar force to the side panels yields no such action. Rather, the force is initially resisted, then, if a substantial force is applied to the side walls, they abruptly crumple or collapse inwardly.

The neck of the bottle is formed with a screw thread 30 and the cap 32 has a corresponding internal screw thread. It also has child-proof and tamper-evident features. These features are all entirely standard and will not be described further.

The distance between the top of the upper region 12 (ie the base of the neck 14) to the waist 18 is approximately four-tenths of the distance between the top of the upper region 12 to the base wall 20.

In this embodiment the width of the base wall is about 5.3 cm. The width of the waist is about 4.7 cm. The maximum width of the upper region is about 5.0 cm. The distance between the top of the upper region and the waist is about

4.0 cm and the distance between the top of the upper region and the base wall is about 10.0 cm. The volume of the bottle (not including the neck space) is about 140 ml and is intended to supply about 125 ml of liquid medicine.

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To use the bottle the cap is removed, the bottle is inverted or downwardly tilted (as the user prefers), and the front and/or rear panel pressed in order to dispense liquid medicine into a measuring device, for example a measuring cup or spoon. The bottle is designed so that the user is encouraged to press the front and/or rear panel 2, 4 in order to impel the liquid medicine through the closure 24. Moreover, it is designed so that it fits comfortably within the hand, with the fingers of the user around the lower region, with the forefinger resting under one of the shoulders 14, 16, that is, around the waist 18; or with fingertips on one panel and thumb on the other. We have found that when the user grasps the bottle in either of these ways reliable dispensing can most readily be achieved. Accordingly the design of the bottle, with its box-type structure and with its tapering lower region, the shoulders and the waist in between, is intended to maximise the likelihood of the user holding the bottle in one of these ways.

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When the required amount of liquid medicine has been dispensed the user releases the force on the bottle and the stream of liquid medicine is choked off immediately, by the coming together by the slits of the closure 24.